Asset Analytics: Your Path to 2020 and Beyond

Ravi Nair
Arizona Public Service

Ravi Pradhan
Siemens

Ajay Madwesh
Space-Time Insight
The Need for Asset Analytics

Ravi Nair
About Arizona Public Service (APS)

- Total customers: 1.2 M
- Square mile service area: 34,646
- Distribution line miles: 28,979
- Transmission line miles: 5,958
APS has significant room for improvement in T&D asset management against applicable ISO 55001 elements.

A 3-year roadmap to improve APS T&D asset management has been developed to address observed gaps.

Analytics improvement is a key underlying theme of many of the Year 1 initiatives.
Asset analytics is integrated within the enterprise analytics strategy.
APS Asset Intelligence: Use Cases

2016

- Visualization & dashboards: summary, hierarchy and map views
- Asset health index (AHI): Transformer and underground cables
- Data quality metrics: Confidence and completeness
- Dissolved gas analysis for transformers: Display and link from Toan
- Maintenance optimization charts
### 2017 - 2018

<table>
<thead>
<tr>
<th></th>
<th>Development Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Develop risk matrix and risk register tool</td>
</tr>
<tr>
<td>2.</td>
<td>Develop risk-based business rules (repair, replace, run to failure) to optimize OPEX &amp; CAPEX</td>
</tr>
<tr>
<td>3.</td>
<td>Define/document IT needs, data governance and improve data quality</td>
</tr>
<tr>
<td>4.</td>
<td>Develop overall T&amp;D strategic asset management (AM) plan and comprehensive AM plans for each asset class</td>
</tr>
<tr>
<td>5.</td>
<td>Integrate additional asset classes (bushings, breakers, and transformers)</td>
</tr>
</tbody>
</table>
Asset Analytics for Transmission Operations

Ravi Pradhan  Ajay Madwesh
Reliability and Network Operations – Asset Health as a Key Variable

Using predictive analytics to model failures and impact on network operations

- Assets aging beyond designed life
- Increased regulatory focus on Loss-of-Load Probability (LOLP), Loss of Load Hours (LOLH)
- Allocating scarce capital and operations budgets
Asset Analytics for Transmission Operations

- Models for 34 asset classes and more than 85 asset types
- Completeness and confidence metrics to identify incomplete or missing data
- A single pane of glass to operate an asset health center
- Predictive analysis to outline capital forecast and perform what-if analysis
Standards-based Approach - IEC CIM for Asset and Network Modeling

- Model all assets and the network using the IEC CIM in tools such as the Spectrum Power Information Model Manager
- A registry for all assets for an accurate representation of the assets as operated
- Associates all measurements, fault indicators and sensor data with assets
- Capable of modeling assets and networks changing over time
Asset Intelligence – Analytics and Visualization

- Aggregate asset summary view
- Summary view on asset class and sub-class
- Geospatial network model view
- Asset health and asset risk metrics
- Prebuilt charts including asset plot of risk/age, age/number of assets
- Predictive and forecast models
- What-if and capital planning
- Duval Triangle view
Asset Intelligence Data Sources

- Data collected from an existing SCADA can be stored in a historian like PI, eDNA or HIS:
  - Voltages, current, kW/MW flows, temperature, dissolved gas data
  - Number of operations, alarm conditions
  - Fault data, sensor data
  - Connectivity

- Asset Intelligence accesses data from the Historian using IDs from the CIM model
- Asset health index is computed using this data along with the age of the asset

AHI = f(x) (Condition, Age)
Asset Health – Key Input into Contingency Analysis

- Asset Health Index (AHI) can be an input to Spectrum Power Contingency Analysis - indicates severity and likelihood of failure
- Use AHI thresholds to include assets in the study
- Flag assets with high AHI in post-contingency results
• To assess impact of outages, ISOs use a variety of tools to determine reliability and economic aspects: power flow, contingency analysis, voltage stability, market simulations tools, etc.

• An outage-at-a-time approach in the analysis of outages results in suboptimal outcomes

• Conservative decisions are made limiting the number of accepted outages

• Spectrum Power Integrated Outage Optimization & Co-ordination studies outage schedules for all generation and transmission resources while respecting operating and security constraints

• The asset health index can be introduced as an additional constraint to allow prioritization in scheduling the outage
Value Summary

**Improved Network Performance**
- Helps an engineer understand the network performance with asset health as an important criteria

**Improved Operations Planning**
- Use of Asset health as an key attribute for better dispatch

**Advancing Reliability Improvement**
- Modeling Asset failures as a result of weather conditions and an assets failure propensity
- Reliability applications such as contingency analysis now can model asset health and potential asset failures as a result of weather

**Advancing Integrated Optimal Outage Coordination (IOOC)**
- Asset health can be used as an input to trigger IOOC so that an economic assessment of taking an outage to address the equipment deemed at risk can be assessed
Asset Intelligence: Complimentary Assessment

- Limited availability of complimentary assessments
- A collaborative, half-day workshop
- Interactive format involving key stakeholders, business owners and experts from your team and ours

Findings and recommendations shared within two weeks

- Summary of assessment workshop
- Review of findings
- Your potential benefits with Asset Intelligence
- Proposed next steps

Request your assessment today:
www.spacetimeinsight.com/Al_workshop